REMARKS

Claims 1, 3-5, 9-10, 12-15, 17-21 and 27-29 were pending in the application. Claims 13 and 15 stand objected to. Claims 1 and 13-15 were amended. Claims 41-53 were added.

Claims 1, 3-5, 9-10, 12, 14, 17-21, 27 and 29 stand rejected under 35 U.S.C. 102(e) as being anticipated by Burns et al. (US Patent 6,707,950 B1). The rejection stated in relation to Claim 1:

> 'Regarding claim 1, Burn et al. discloses a method for estimating the noise appearance in an image, comprising the steps of:
>
> 'a) forming a noise table (Fig. 4, num. 30_{i+1}: METADATA TRANFORM i+1 forms a noise table as shown in fig. 7 and mentioned in col. 7, lines 50,51.) representing noise magnitude vs. intensity (Fig. 4, num. 30_{i+1}: METADATA TRANFORM i+1 forms a noise table as shown in fig. 7 representing noise magnitude that corresponds to a vertical axis vs. intensity that corresponds to the horizontal axis of fig. 7.) of the image (Fig. 4, num. 30_{i+1} : METADATA TRANFORM i+1 forms a noise table as shown in fig. 7 representing noise magnitude that corresponds to a vertical axis vs. intensity that corresponds to the horizontal axis of fig. 7 of the image, f_{i+1} (x,y), of fig. 4.); and
>
> 'b) generating a noise metric (Fig. 4, num. 30_{i+1}: METADATA TRANFORM i+1 generates a noise metric or "standard deviation [of noise]" in col. 7, lines 53,54.) from the noise table (Fig. 4, num. 30_{i+1}: METADATA TRANFORM i+1 generates a noise metric or "standard deviation [of noise]" in col. 7, lines 53,54 and shown in the vertical axis from the noise table of fig. 7.), said noise metric (The noise metric or "standard deviation [of noise]" in col. 7, lines 53,54.) representing the noise appearance in the image as seen by a human observer (The noise metric or "standard deviation [of noise]" in col. 7, lines 53,54 represents the noise appearance in the image, f_{i+1} (x,y) of fig. 4, as seen by a human observer using fig. 1, num. 12: IMAGE OUTPUT which is a device that a human would use to see the displayed image, f_{i+1} (x,y) of fig. 4.);

'c) wherein the step of forming a noise table (Fig. 4, num. 30_{i+1} : METADATA TRANFORM i+1 forms a noise table as shown in fig. 7 and mentioned in col. 7, lines 50,51.) includes the steps of:

'a1) forming an input noise table (Fig. 4, label "M_i" corresponds to forming or "providing" in col. 2, line 51 a noise table as shown in fig. 6.) representing noise magnitude vs. intensity (Fig. 4, label "M_i" corresponds to forming or "providing" in col. 2, line 51 a noise table as shown in fig. 6 that represents noise magnitude that corresponds to a vertical axis vs. intensity that corresponds to the horizontal axis of fig. 6) of an input image (Fig. 4, label "M_i" corresponds to forming or "providing" in col. 2, line 51 a noise table as shown in fig. 6 that represents noise magnitude that corresponds to a vertical axis vs. intensity that corresponds to the horizontal axis of fig. 6 of an input image, f_i (x,y) of fig. 4.);

'a2) providing an image processing chain (Fig. 1, num. 10: IMAGE PROCESSING CHAIN provides an image processing chain as shown in figs. 2 and 3, num. 10 and fig. 4,num. 20_{i+1}.) including one or more image transforms (Fig. 4,num. 20_{i+1} is one image transform.);

'a3) determining an appropriate noise transform (Fig. 4, num. 40_{i+1}: METADATA TRANSFORM GENERATOR i+1 determines or "generates...an appropriate...transform for...noise data (col. 6, lines 15-19).") defining [the] **an** effect (Fig. 4, num. 40_{i+1} : METADATA TRANSFORM GENERATOR i+1 determines or "generates...an appropriate...transform for...noise data (col. 6, lines 15-19)" defining an effect via an output arrow of 40_{i+1} that causes the effect.) that each image transform will have on the noise in the image (Fig. 4, num. 40_{i+1} : METADATA TRANSFORM GENERATOR i+1 determines or "generates...an appropriate...transform for...noise data (col. 6, lines 15-19)" defining an effect via an output arrow of 40_{i+1} that causes the effect that each image transform, fig. 4,num. 20_{i+1}: IMAGE TRANSFORM i+1, via the process of num. 40_{i+1} will have on the noise or "noise data" in col. 6, lines 15-19, M_i of fig. 4, in the image f_i (x,y) to define the above mentioned effect.); and

'a4) applying the one or more noise transforms (The transform for...noise data (col. 6, lines 15-19) and shown in fig. 4, num. 30_{i+1}: METADATA TRANSFORM 1+1 is applied via inputting M_i of fig. 4.) to the input noise table (The transform for...noise data (col. 6, lines 15-19) and shown in fig. 4, num. 30_{i+1}: METADATA TRANSFORM I+1 is applied via inputting M_i of fig. 4 which corresponds to the noise table as shown in fig. 6.) to produce the noise table (The transform for...noise data (col. 6, lines 15-19) and shown in fig. 4, num. 30_{i+1}: METADATA TRANSFORM I+1 is applied via inputting M_i of fig. 4 which corresponds to the noise table as shown in fig. 6 to produce the noise table as shown in fig. 7 and mentioned in col. 7, lines 45-51.) representing an estimate (The transform for...noise data (col. 6, lines 15-19) and shown in fig. 4, num. 30_{i+1}: METADATA TRANSFORM I+1 is applied via inputting M_i of fig. 4 which corresponds to the noise table as shown in fig. 6 to produce the noise table, "M_{i+1}" in col. 8, line 43 of fig. 4 and shown in fig. 7 and mentioned in col. 7, lines 45-51 which represents an "estimat[e]" in col. 8, line 41.) of the noise in the image (The transform for...noise data (col. 6, lines 15-19) and shown in fig. 4, num. 30_{i+1}: METADATA TRANSFORM I+1 is applied via inputting M_i of fig. 4 which corresponds to the noise table as shown in fig. 6 to produce the noise table, "M_{i+1}" in col. 8, line 43 of fig. 4 and shown in fig. 7 and mentioned in col. 7, lines 45-51 which represents an "estimat[e]" in col. 8, line 41 of the noise or "noise data" in col. 6, lines 15-19, M_i of fig. 4, in the image f_i (x,y).); and

'd) further comprising the steps of:

'd1) forming a predetermined input noise table (Fig. 6 is a predetermined input noise table is "provided" in col. 9, line 60.) for a specific image capture process (Fig. 6 is a predetermined input noise table is "provided" in col. 9, line 60 for a specific image capture process or "scanned film" in col. 7, line 46.);

'd2) using the predetermined input noise table (Fig. 6 is a predetermined input noise table that is used in the process of fig. 4) to generate the noise metric (Fig. 6 is a predetermined input noise table that is used in the process of fig. 4 to generate the noise metric or "standard deviation [of noise]" in col. 7, lines 53, 54.) for an image (Fig. 6 is a

predetermined input noise table that is used in the process of fig. 4 to generate the noise metric or "standard deviation [of noise]" in col. 7, lines 53, 54 for an image f_{i+1} (x,y) of fig. 4.) captured by the specific process (Fig. 6 is a predetermined input noise table that is used in the process of fig. 4 to generate the noise metric or "standard deviation [of noise]" in col. 7, lines 53, 54 for an image f_{i+1} (x,y) of fig. 4 captured by the specific process or "scanned film" in col. 7, line 46.).'

Claim 1 states:

1. A method for estimating the noise appearance in an image, comprising the steps of:

a) forming an output noise table representing noise magnitude vs. intensity of the image; and

b) generating a scalar noise metric from the output noise table, said noise metric having a value representing the noise appearance in the image as seen by a human observer;

wherein the step of forming an output noise table includes the steps of:

a1) forming an input noise table representing noise magnitude vs. intensity of an input image;

a2) providing an image processing chain including one or more image transforms;

a3) determining an appropriate noise transform defining the effect that each image transform will have on the noise in the image; and

a4) applying the one or more noise transforms to the input noise table to produce the output noise table representing an estimate of the noise in the image.

Amended Claim 1 is supported by the application as filed, notably original Claims 1, 12, 14, and 27; and at page 7, lines 14-16. Claim 1 has been amended to refer to the "noise table" used in reference to the output noise table as "output noise table". This is supported by the application as filed, notably, original Claims 14 and 27.

Claim 1 requires forming an output noise table representing noise magnitude vs. intensity of the image and generating a noise metric from the

output noise table. These are two separate steps and the noise metric is generated from the noise table. In Burns, a noise table is formed. The step of forming the output noise table of Claim 1 is like Burns. In the application, Burns (U.S. Patent No. 6,707,950) is cited (by patent application number) in that regard. The application states:

"The process of applying noise transforms **30** to a noise table in order to model the effects on noise resulting from the application of image transforms **20** to an image is known as noise propagation. The noise path applicator **22** performs noise propagation in order to generate the output noise table. US Serial No. 09/337,792, filed June 22, 1999 by Burns et al. describes in detail noise propagation in imaging systems using noise tables. In addition, the Burns application describes the method by which the noise transforms **30** are generated from the image transforms **20**, as shown in Fig. 5.

"For example, if the image transform $\mathbf{20_1}$ is the application of a LUT to the image, then the image transform $\mathbf{20_1}$ can be represented mathematically as the function $g_1(n)$:

$$f_1(x,y) = g_1(f_0(x,y)),$$

where $f_0(x,y)$ is an image input to the image transform $\mathbf{20_1}$ and $f_1(x,y)$ is an image output from the image transform $\mathbf{20_1}$.

"Assuming that the image noise is Gaussian and the LUT is locally linear, the noise transform generator **40** of the noise path generator **16** would create a noise transform $\mathbf{30_1}$ corresponding to the image transform $\mathbf{20_1}$ such that the noise table $N(\sigma(i), i)$ consisting of intensity levels i and noise values corresponding to the intensity levels $\sigma(i)$:

$$N(\sigma(i), i)$$

is propagated to create the new noise table N_1:

$$N_1(\sigma_1(i_1), i_1) = N(g_1'(i) * \sigma(i), g_1(i)),$$

where $g_1'(i)$ is an approximation of the slope of the LUT, evaluated at intensity i. Approximating the local slope of a LUT is well known to those skilled in the art. Fig. 6 illustrates that each image transform $\mathbf{20_m}$ has a corresponding noise transform $\mathbf{30_m}$ which is applied to the noise table N_0 by the noise path applicator **22** in order to produce an output noise table N_M.

"In a similar manner, the noise table can be propagated through noise transforms **30** corresponding to a wide variety of image transforms **20**. Burns et al. describe in detail, noise propagation for image transforms of LUTs, balance shifts, matrices, etc." (Application, page 12, line 3 to page 13, line 1; emphasis added)

Claim 1 has as two different steps: the step of forming the output noise table and the step of generating a noise metric from the output noise table. These steps inherently cover different features. (The office action has not argued to the contrary.) Burns lacks two different steps of forming an output noise table and generating a noise metric from the output noise table.

The rejection relies upon Burns as disclosing a '"standard deviation [of noise]" in col. 7, lines 53,54 and shown in the vertical axis from the noise table of fig. 7.' The term "standard deviation [of noise]" infers calculation of a standard deviation of noise values. There is no such calculation disclosed in Burns. There is no "standard deviation [of noise]" or "standard deviation of noise" shown anywhere in Figure 7. The noise table of Burns Figure 7, has a vertical axis that represents noise magnitude in units of standard deviation of output signal level. This is equated with the term "noise". (See Figure 7, vertical axis caption and captions of the plots for the different colors--each labelled "NOISE".) Burns does use the term "standard deviation of noise", but when considered in context, it is apparent that the usage "standard deviation of noise" is a typographical error and should be something like "standard deviation (noise)". Burns states at col. 7, lines 45-55:

"An example for the original signal dependent noise table for a scanned film is shown in FIG. 6. Using the sensitometry correction LUT shown in FIG. 5 as the image transform under consideration, the metadata transform for noise characteristics is represented by equation 8. Application of this metadata transform to the original noise data yields the noise table in FIG. 7. The table in FIG. 7 is a modified noise table to compensate for the sensitometry correction LUT, wherein the standard deviation of the noise is shown for the colors red, green, and blue." (emphasis added)

Burns indicates that the "standard deviation of the noise" is shown for each of the colors red, green, and blue. There are three plots in Figure 7. Each plot is labelled with a channel identifier and "NOISE". This is in accord with the

vertical axis of Figure 7: "STANDARD DEVIATION OF OUTPUT SIGNAL LEVEL (NOISE)". In other words, the standard deviation of the output signal level, i.e. the noise, is shown for each channel. "Standard deviation of the noise" is not a metric generated from the noise table. There is only the noise table.

Claim 1 requires that the noise metric has a value representing the noise appearance in the image as seen by a human observer. A vertical axis of a noise table is not a value. Axes quantify plots. In Figure 7, the vertical axis defines standard deviation values for all of the output signal levels shown for each of the colors. (See also discussion of Claim 12 below.)

Claim 1 requires generating a <u>scalar</u> noise metric. The rejection indicates that Burns 'generates a noise metric or "standard deviation [of noise]" in col. 7, lines 53,54 and shown in the vertical axis from the noise table of fig. 7'. The cited portions of Burns do not disclose a standard deviation of noise, but rather a table of noise versus output signal level, with noise being defined as the standard deviation of the output signal level. Rather than being a scalar metric, the noise table of Figure 7 plots the output signal level for each color versus standard deviation of the output signal level. Burns indicates this at col. 7, lines 51-55:

> "The table in FIG. 7 is a modified noise table to compensate for the sensitometry correction LUT, wherein the standard deviation of the noise is shown for the colors red, green, and blue." (Also see Burns, Figure 7, captions: "u (BLUE) NOISE", "s (RED) NOISE", and "t (GREEN) NOISE".)

Claim 1 requires generating a scalar noise metric from the output noise table, the noise metric representing <u>the noise appearance in the image as seen by a human observer</u>. The rejection cites Burns and indicates that the noise metric or "standard deviation [of noise]" in col. 7, lines 53-54 represents noise appearance in the image and mentions a device that a human would use to see the displayed image. The difference between standard deviation of noise and the appearance of noise to a human observer is addressed in the application:

> "The root mean square (rms) value or <u>standard deviation</u> is used as a measure of the variation in density of an otherwise uniform area. This value is referred to as the <u>granularity.</u> An output image is perceived by <u>an observer</u> and the perception of these unwanted, random fluctuations in

optical density are called graininess or noise appearance." (Application, page 1, lines 20-24; emphasis added; see also page 1, lines 25-28)

Granularity and graininess or noise appearance are not the same and granularity does not represent the appearance of noise to a human observer. The application cites a published equation that made it possible to estimate graininess from granularity:

> "He [C. Bartleson] determined the following relationship between the graininess G_i and the granularity σ_v
>
> $$G_i = a * \log(\sigma_v)+b$$
>
> where a and b are constants." (Application, page 1, line 31 to page 2, line 2; see generally page 1, line 28 to page 2, line 12)

The application then notes that:

> "the noise appearance of any given output image produced with a given imaging system may be quite different than the estimate enabled by Bartleson's work." (Application, page 2, lines 10-12)

The application describes further efforts to relate granularity and graininess on pages 2-4.

Claims 3-5, 9-10, 12, 14, 17-21, and 29 are allowable as depending from Claim 1 and as follows.

In relation to Claim 12, the rejection stated:

> 'Regarding claim 12, Burns et al. discloses the method claimed in Claim 1, wherein the step of generating a noise metric (Fig. 4, num. 30_{i+1}: METADATA TRANFORM i+1 generates a noise metric or "standard deviation [of noise]" in col. 7, lines 53, 54.) includes the step of:
>
> 'a) locating [the] a peak value (Fig. 7 shows a vertical axis that can be used to locate a peak value or "high noise" in col. 7, line 58.) of the noise table (Fig. 7 shows a vertical axis that can be used to locate a peak value or "high noise" in col. 7, line 58 that was generated from fig. 4, num. 30_{i+1}: METADATA TRANFORM i+1 that forms the noise table as shown of fig. 7 and mentioned in col. 7, lines 50, 51.) to obtain the noise metric (Fig. 7 shows a vertical axis that can be used to locate a peak value or "high noise" in col. 7, line 58 that was generated from fig. 4, num. 30_{i+1}: METADATA TRANFORM i+1 that forms the noise table as shown of fig. 7 and mentioned in col. 7, lines 50, 51 and obtains the noise metric or

"standard deviation [of noise]" in col. 7, lines 53, 54 via the above mentioned vertical axis.).'

Claim 12 states:

12. The method claimed in Claim 1, wherein the step of generating a noise metric includes the step of locating the peak value of the noise table to obtain the noise metric.

The rejection asserts that Figure 7 shows a vertical axis that <u>can be used</u> to locate a peak value or "high noise" of the noise table. Burns does not teach or suggest use of the peak value or "high noise" as a metric. The position taken by the rejection, by its nature, is an obviousness argument.

In addition, the rejection fails to present any motivation for "can be used". What would motivate one of skill in the art to so use a peak value or "high noise" as a metric? Where does Burns teach or suggest any use of a particular value in relation to noise? The cited portion of Burns only looks at groups of values:

"It can be noticed that FIG. 7 shows extremely high noise at low input signal levels." (Burns, col. 7, lines 57-58)

The term "signal levels" is plural. This makes "high noise" also plural.

In relation to Claim 14, the rejection stated:

'Regarding claim 14, Burns et al. discloses the method claimed in claim 1, wherein the step of generating the noise metric (Fig. 4, num. 30_{i+1}: METADATA TRANFORM i+1 generates a noise metric or "standard deviation [of noise]" in col. 7, lines 53,54.) includes the step of:

'a) performing a summation (Equation 14 performs summation.) of the noise table (Using an equation of column 9, line 63 and mentioned in col. 9, lines 59-65, equation 14 performs summation of the noise table, N and shown in fig. 7 and mentioned in col. 7, lines 50,51.).) to obtain the noise metric (Using an equation, σ, of column 9, line 63 and mentioned in col. 9, lines 59-65, equation 14 performs summation of the noise table, N and shown in fig. 7 and mentioned in col. 7, lines 50, 51 to obtain the noise metric or "standard... deviation" in col. 9, line 64, σ.) 15 (original). The method claimed in Claim 14, further including the step of taking the logarithm of the integration or summation to obtain the noise metric.'

Claim 14 states:

14. The method claimed in Claim 1, wherein the step of generating the noise metric includes the step of performing an integration or summation of the output noise table to obtain the noise metric.

Claim 14 has been amended in accord with the changed language of Claim 1.

Claim 14 requires performing an integration or summation of the output noise table. The cited portion of Burns does not teach or suggest such an operation, but rather relates to operations performed on <u>the input noise table</u>. Burns states:

"It is assumed that the expected noise as a function of signal level is provided in the form of a noise table as the one described in U.S. Pat. No. 5,641,596,

"$\sigma = N[f(x,y)]$

where σ is the noise standard deviation, and N is the noise table.

"<u>FIG. 6</u> presents an example of the noise table for scanned negative film. The sigma filter will select those pixels in the local window that fall inside some pre-defined number of intensity standard deviations from the center pixel intensity. The center pixel is then replaced by the average of the selected pixels. That is, ... we can express the local filter transform of size mxn by the following equations:

Let [equation 13]

where ...

Then, [equation 14].

"After applying the adaptive noise reduction algorithm to the image, the previously acquired metadata elements corresponding to noise characteristics, provided in the noise table, are no longer valid. Therefore, a metadata transform needs to be determined to modify the noise elements in the metadata. Let ...

"Then, the noise at every image plane could be propagated via the two dimensional function, $\alpha(x,y)$, where each location (x,y) corresponds to a location (x,y) in the digital image $f_{i+1}(x,y)$. In essence, $\alpha(x,y)$ along with the original noise variance statistics $\sigma_{pp}(d)$, become the localized metadata or noise data map L(x,y). The entries at every (x,y) location in L(x,y) when multiplied by the original noise variance statistics

σ_{pp}(d), correspond to the new noise variance statistics as a function of signal level, in the form of a noise table." (Burns, col. 9, line 59 to col. 10, line 62; emphasis added)

The rejection is contradicted by the underlined language in the above quote. Figure 6 is the input noise table and Equation 14 is discussed in relation to that input noise table.

In relation to Claim 20, the rejection states:

'Regarding claim 20, Burns et al. discloses the method claimed in claim 1, further comprising the step of using the noise metric (The noise metric or "standard deviation [of noise]" in col. 7, lines 53, 54 as shown in the vertical axis of fig. 6 is used in the process of fig. 4 as an input M_i.) to estimate (The noise metric or "standard deviation [of noise]" in col. 7, lines 53, 54 as shown in the vertical axis of fig. 6 is used in the process of fig. 4 as an input M_i for "estimating" in col. 8, line 41.) [the] an image quality (The noise metric or "standard deviation [of noise]" in col. 7, lines 53, 54 as shown in the vertical axis of fig. 6 is used in the process of fig. 4 as an input M_i for "estimating" in col. 8, line 41 an image quality "metadata M_{i+1}" in col. 8, line 43.).'

Claim 20 states:

"20. The method claimed in Claim 1, further comprising the step of using the noise metric to estimate the image quality."

Claim 20 requires using a noise metric, which was generated from the output noise table. The rejection supposes the generation of a noise metric from the input noise table and then supposes use of that "metric".

The rejection stated as to Claim 29:

'Regarding claim 29, Burns et al. discloses the method claimed as in claim 1, further comprising the step of:

'a) sorting images (Fig. 3 shows an image fo (x, y) that is sorted which is a form of arranged or separated via an image transform chain from an image fN(x,y).) from least to most noisy in appearance (Fig. 3 shows an image fo (x, y) that is sorted which is a form of arranged or separated via an image transform chain from an image fN(x,y) from least to most noisy in appearance or "along an image processing chair to

improve... image quality (col. 2, lines 43-47).") according to the noise metric (Fig. 3 shows an image fo (x, y) that is sorted which is a form of arranged or separated via an image transform chain from an image fN(X,Y) from least to most noisy in appearance or "along an image processing chain to improve... image quality (col. 2, lines 43-47)" according to the noise metric generated in fig. 4, num. 30i.+1: METADATA TRANFORM i+1 that generates a noise metric, Mi as seen in fig. 3, or "standard deviation [of noise]" in col. 7, lines 53, 54.).'

Claim 29 states:

> 29. The method claimed as in Claim 1, further comprising:
>
> repeating said forming and generating steps with a plurality of additional images; and
>
> sorting all of said images from least to most noisy in appearance according to respective said noise metrics.

The changed language of Claim 29 is supported by the application as filed, notably the original claims and at page 17, lines 2-7.

Claim 29 requires repeating the forming and generating steps with additional images and sorting the images from least to most noisy in appearance according to respective noise metrics. The rejection addresses an image transform chain producing <u>a single noise table.</u> The cited portions of Burns are directed to an image transform chain for one image with one M_i the proposed "metric" of the rejection. Claim 29 requires sorting, according to respective noise metrics, all of images of multiple forming and generating steps.

Claim 28 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Burns et al. (US Patent 6,707,950 B1) in view of Burns et al. (US Patent 6,707,950 B1) (The rejection was interpreted as holding that Claim 28 was rejected under 35 U.S.C. 102(e) as being anticipated by Burns et al. (US Patent 6,707,950 B1).) The rejection stated:

'Regarding claim 28, Burns et al. teaches the limitation of predicting [the] an appearance of noisiness of an image ("estimating non-image information" in col. 1, lines 58, 59 such as "noise statistics" in col. 1, lines 17-20) as seen ("estimating non-image information" in col. 1, lines 58, 59 such as "noise statistics" in col. 1, lines 17-20 which "can be seen to characterize ... image noise in actual scenes" in col. 1, line 43.) by a

human observer ("estimating non-image information" in col. 1, lines 58, 59 such as "noise statistics" in col. 1, lines 17-20 which "can be seen to characterize ... image noise in actual scenes acquired" in col. 1, line 43; where the word "seen" corresponds to a human action that sees image noise in actual scenes acquired.) using a noise metric ("estimating non-image information" in col. 1, lines 58, 59 such as "noise statistics" in col. 1, lines 17-20 which "can be seen to characterize... image noise in actual scenes acquired" in col. 1, line 43; where the word "seen" corresponds to a human action that sees image noise in actual scenes acquired using a noise metric or "rms values" in col. 1, line 23.) from a noise table ("estimating non-image information" in col. 1, lines 58, 59 such as "noise statistics" in col. 1, lines 17-20 which "can be seen to characterize ... image noise in actual scenes acquired" in col. 1, line 43; where the word "seen" corresponds to a human action that sees image noise in actual scenes acquired using a noise metric or "rms values" in col. 1, line 23 from a noise table or "table or noise" in col. 1, lines 22,23.).'

Claim 28 states:

> 28. The method claimed as in Claim 1, further comprising the step of predicting the appearance of noisiness of an image to a human observer using said noise metric.

Claim 28 is supported by the application as filed, notably the original claims.

Claim 28 requires that the predicting is of the appearance of noisiness to a human observer and that the predicting uses "said noise metric". The rejection states that noise statistics (in Burns et al.):

> "can be seen to characterize... image noise in actual scenes acquired" in col. 1, line 43; where the word "seen" corresponds to a human action that sees image noise in actual scenes acquired using a noise metric or <u>"rms values"</u> in col. 1, line 23." (emphasis added)

As earlier discussed, a human observer does not see noisiness in an image in the same manner as rms values (granularity). The application states:

> "The <u>root mean square (rms) value or standard deviation</u> is used as a measure of the variation in density of an otherwise uniform area. This value is referred to as the <u>granularity</u>. An output image is perceived by an observer and the perception of these unwanted, random fluctuations in

optical density are called graininess or noise appearance." (Application, page 1, lines 20-24; see also page 1, lines 25-28; emphasis added)

The application also indicates that C. Bartleson, in "Predicting Graininess from Granularity," J. Phot. Sci., Vol. 33, No. 4, pp. 117-126, 1985, showed the following relationship between the graininess G_i and the granularity σ_v

$$G_i = a * \log(\sigma_v)+b$$

where a and b are constants. (Application, page 1, line 28 to page 2, line 2) The application notes:

> "Bartleson's work made it possible to estimate the graininess that a given imaging system will produce." (Application, page 2, lines 3-4)

The rejection would, in effect, take a position contradicting the Bartleson reference and arguing that granularity is seen by a human observer. This position is not supported by Burns et al.

The cited portion of Burns et al. uses the word "seen" in relation to seeing a particular mathematical relationship, not in relation to a human observer seeing the noise on which those values are based:

> "Thus if the rms value is computed for uniform areas of various signal levels, the set of these values can be seen to characterize the amplitude of image noise in actual scenes acquired using the same image source, as a function of image signal." (Burns et al., col. 1, lines 41-45)

The operative language from that sentence, for the purpose here, is that the set of rms values can be seen to characterize the amplitude of image noise as a function of image signal. This is a statement about granularity not about the appearance of noisiness of an image to a human observer.

Added Claim 41 states:

> 41. A method for estimating the noise appearance in an output image, said method comprising the steps of:
>
> providing an input image captured using a specific image capture process;
>
> forming an input noise table characterizing said specific image capture process;

determining an image processing chain from said input image to the output image, said image processing chain including one or more image transforms;

applying one or more noise transforms, corresponding to said image transforms, to said input noise table to produce an output noise table representing noise magnitude vs. intensity of said output image; and

generating a scalar noise metric from said output noise table, wherein said noise metric indicates the visibility of noise in the output image as seen by a human observer.

Claim 41 is supported by the original application as filed, notably the original claims. Claim 41 is allowable on the same grounds as Claim 1.

Claims 42-48 are supported by the original application as filed, notably the original claims. Claims 46-48 are also supported at page 7, lines 19-28. Claims 42-48 are allowable as depending from Claim 41 and as follows.

Claim 42 is allowable on the grounds discussed above in relation to Claim 12.

Claim 43 is allowable on the same basis as Claim 13.

Claim 45 is allowable on the same basis as Claim 15.

Added Claim 49 states:

49. A method for estimating the noise appearance in an output image, said method comprising the steps of:

providing an input image captured using a specific image capture process;

forming an input noise table characterizing said specific image capture process;

determining an image processing chain from said input image to the output image, said image processing chain including one or more image transforms;

applying one or more noise transforms, corresponding to said image transforms, to said input noise table to produce an output noise table representing noise magnitude vs. intensity of said output image;

generating a peak or summary value from said output noise table; and

taking the logarithm of said peak or summary value to obtain the noise metric, wherein said output noise metric indicates the visibility of noise in the output image as seen by a human observer.

Claim 45 is supported by the application as filed, notably the original claims. Claim 45 is allowable on the same basis as Claims 13 and 15.

Claims 50-52 are allowable as depending from Claim 49 and are supported in the same manner as Claims 46-48.

Claim 53 states:

53. A method for estimating the noise appearance in an output image, said method comprising the steps of:

examining pixel values of an input digital image;

forming an input noise table representing noise magnitude vs. intensity of said input digital image using said pixel values;

providing an image processing chain from said input digital image to an output digital image, said image processing chain including one or more image transforms;

propagating said input noise table through one or more noise transforms corresponding to said image transforms to produce an output noise table representing an estimate of noise magnitude vs. intensity of said output digital image; and

generating a scalar noise metric from said output noise table, wherein said output noise metric indicates the visibility of noise in the output image as seen by a human observer.

Claim 53 is supported by the application as filed, notably the original claims and at page 12, lines 3-6. Claim 53 is allowable on the grounds discussed above in relation to Claim 1.

It is believed that these changes now make the claims clear and definite and, if there are any problems with these changes, Applicants' attorney would appreciate a telephone call.

In view of the foregoing, it is believed none of the references, taken singly or in combination, disclose the claimed invention. Accordingly, this application is believed to be in condition for allowance, the notice of which is respectfully requested.

Respectfully submitted,

Attorney for Applicant(s)
Registration No. 30,700

Robert Luke Walker/amb
Rochester, NY 14650
Telephone: (585) 588-2739
Facsimile: (585) 477-1148